

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Paul Falkenstein et al.

Application No.: 10/829,614

Confirmation No.: 7320

Filed: April 22, 2004

Art Unit: 1731

For: FUSED ARRAY PREFORM FABRICATION
OF HOLEY OPTICAL FIBERS

Examiner: Q. Dehghan

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

As required under § 41.37(a), this brief is filed within two months of the Notice of Appeal filed in this case on January 11, 2007, and is in furtherance of said Notice of Appeal.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1206:

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I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

The Government of the United States, as represented by the Secretary of the Navy

II. RELATED APPEALS, INTERFERENCES, AND JUDICIAL PROCEEDINGS

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 17 claims pending in application.

B. Current Status of Claims

1. Claims canceled: 1-17
2. Claims withdrawn from consideration but not canceled: none
3. Claims pending: 18-34
4. Claims allowed: none
5. Claims rejected: 18-34

C. Claims On Appeal

The claims on appeal are claims 18-34

IV. STATUS OF AMENDMENTS

Applicant did not file an Amendment After Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention is drawn to a method for making a holey fiber.

An aspect of the present invention is drawn to stacking a plurality of rods and tubes into a bundle 10 as illustrated in Figure 1. Then creating a fused element by heating the rods 12 and tubes 14 to a fusion temperature to soften the rods such that the rods flow around a portion of the tubes 102, such that the tubes retain their shape. The next step as illustrated in Figure 2 includes creating a preform 200 by removing the tubes 14. The preform 200 is then drawn, as illustrated in Figure 3. Accordingly, the preform is created first and then drawn to the appropriate length. (please note the discussion on page 9 second paragraph continuing onto page 10).

Independent claim 1 recites a method for making a holey fiber (for example as illustrated in Figure 3), comprising: stacking a plurality of structures (please see item 10 of Figure 1, and discussion on page 9, lines 9-17) comprising a first structure (please see item 12 of Figure 1) of a first material having a first softening point and a second structure (please see item 14 of Figure 1) of a second material having a hollow central portion and a second softening point that is higher than the first softening point, said stacking comprises arranging the plurality of structures to form a bundle containing interstices (please see item 16 of Figure 1) between the structures; creating a fused element (please see item 100 of Figure 1, and discussion on page 9, lines 18-25) by heating the bundle (please see item 100 of Figure 2) to a fusion temperature to soften the first structure such that the first structure flows around a portion of the second structure and closes a portion of the interstices, and such that the second structure retains shape; creating a preform (please see item 200 of Figure 2, and discussion on page 11, lines 6- 18) having channels therein, by removing (please see item 202 in Figure 2, and discussion on page 11 lines 17-18) the second structure from the fused element; drawing the preform (please see discussion on page 11, line 20- page 12 line 13) at a draw temperature which is below the softening point of the first structure.

Independent claim 31 recites a method for making a holey fiber comprising: stacking a plurality of structures (please see item 10 of Figure 1, and discussion on page 9, lines 9-17) comprising a first structure (please see item 12 of Figure 1) of a first material having a first

softening point and a second structure (please see item 14 of Figure 1) of a second material having a hollow central portion and a second softening point that is higher than the first softening point, the first structure being glass rods or tubes and the second structure being non-glass tubes that are rigid at the first softening point to form a bundle containing interstices (please see item 16 of Figure 1) between the structure; forming a fused element (please see item 100 of Figure 1, and discussion on page 9, lines 18-25) by heating the bundle (please see item 100 of Figure 2) to a fusion temperature which is near the first softening point of the glass rods or tubes whereby the glass softens and flows around the non-glass tubes and closes the interstices; creating a preform (please see item 200 of Figure 2, and discussion on page 11, lines 6- 18) by removing the non-glass tubes from the fused element thus forming channels in the fused element; and drawing the preform (please see discussion on page 11, line 20- page 12 line 13) at a draw temperature which is near the softening point of the glass rod or tubes to form the holey fiber (please see item 700 of Figure 7, and discussion on page 13, lines 12-15).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A). The first ground of rejection to be reviewed on appeal, with reference to page 3 of the Final Office Action dated October 12, 2006, is whether claims 18 and claims 19-30 are patentable over Berkey in view of Siegmund.

B). The second ground of rejection to be reviewed on appeal, with reference to page 3 of the Final Office Action dated October 12, 2006, is whether independent claim 31 and claims 32-34 are patentable over Berkey in view of Siegmund.

VII. ARGUMENT

Applicants respectfully submit that independent claims 18 and 31 are patentable over Berkey in view of Siegmund. The Examiner asserts that claims 18 and 31 are unpatentable over Berkey in view of Siegmund in light of 35 U.S.C. § 103(a). Applicants respectfully disagree.

As discussed on page 8 of the Amendment dated August 9, 2006, Applicants state “Berkey et al. recites the use of at least one sacrificial rod having an outside surface...Berkey et al. further discloses the sacrificial rod as a material that can be removed from the structured body either chemically or physically. This is in contrast to independent claim 18 which recites the second material having a hollow central portion. As is understood by those skilled in the art, a rod has a solid core and not a hollow central portion.”

Siegmund teaches tubules that are drawn (see col. 4, lines 10-15 of United States Patent No. 3,275,428 to Siegmund). The tubules are then cut transversely in length and etched thus forming a preform (see col. 5, lines 28-42 of Siegmund). The cutting is done to etch the remaining tubules that are now too narrow to receive the etchant all the way through the tubules.

As pointed out in the interview conducted on November 28, 2006 and stated in the Response dated December 6, 2006, the tubules of Siegmund are first drawn, then the a preform is created. Accordingly, Siegmund teaches drawing the tubules then creating the preform.

As stated on page 2 of the Response dated December 6, 2006, independent claim 18 recites, *inter alia*,

stacking a plurality of structures..., creating a fused element by heating..., **creating a preform** having channels therein by removing the second structure from the fused element, **drawing the preform** at a draw temperature.

The tubules of Siegmund cannot simply be viewed on their own and substituted into the device of Berkey, as the comments indicate in the Advisory Action dated January 4, 2007. Applicants respectfully submit that such an assertion is incorrect. Rather, the entire method of making the glass honeycomb structure as disclosed in Siegmund should be considered. as stated in MPEP § 2141.02 section VI, requiring the “prior art be considered in its entirety, including disclosures that teach away from the claims.”

As noted above, Siegmund discloses drawing the tubules, forming the preform, cutting the preform, and etching the preform. The claim limitations as recited in independent claim 18 require, *inter alia*, “creating a fused element by heating..., creating a preform having channels therein by removing the second structure from the fused element, drawing the preform at a draw temperature...” The drawing recited in independent claim 18 is required to be performed after the preform has been created. This prevents the tubules from collapsing upon themselves. This point was highlighted at the interview conducted on November 28, 2006, where the Applicant presented an exhibit fiber having tubules similar to those disclosed in Siegmund that was made in the method as disclosed in Berkey. In other words, the exhibited fiber was first preformed and then drawn. The tubules, as disclosed in Siegmund, collapsed onto themselves when formed by the method disclosed in Berkey, thus the Applicants were not able to produce a usable piece of holey fiber.

Applicants respectfully submit that one of ordinary skill in the art would consider the entire contents of Siegmund including drawing the tubules and then creating the preform. This concept teaches away from the idea of creating the preform by removing the tubules and then drawing the preform, as recited in independent claim 18.

As mentioned above, the tubules of Siegmund alone cannot be employed into Berkey. Rather the whole method of Siegmund is considered and employed in Berkey, see MPEP 2141.02 section VI. Accordingly, Siegmund discloses drawing the tubules, and then forming the preform. This is in direct contrast to the limitation in independent claim 18 of creating the preform, and drawing the preform. As mentioned above, Berkey discloses creating the preform with rods and drawing the rods. Berkey does not employ tubes.

It is respectfully submitted that neither Berkey nor Siegmund discloses the limitations of independent claim 18. Thus the combination Berkey in view of Siegmund does not produce a *prima facie* case of obviousness to overcome the patentability of independent claim 18 within the meaning of 35 U.S.C. § 103(a).

Claims 19-30 are dependent upon claim 18, and therefore include all the limitations thereof. As such, claims 19-30 are patentable over the combination of Berkey in view of Siegmund for at least the same reasons that claim 18 is patentable over the combination of Berkey in view of Siegmund within the meaning of 35 U.S.C. § 103(a).

As stated on page 3 of the Response dated December 6, 2006, the claim limitations of independent claim 31 are similar to independent claim 18. A recitation of claim 31, *inter alia*, includes

stacking a plurality of structures comprising a first structure of a first material having a first softening point and a second structure of a second material having a hollow central portion and a second softening point that is higher than the first softening point, the first structures being glass rods or tubes and the second structure being non-glass tubes ..., forming a fused element by heating the bundle to a fusion temperature, creating a preform ... and drawing the preform at a draw temperature.

Specifically, independent claim 31 includes the limitations of creating a preform by removing the non-glass tubes, and drawing the preform at a draw temperature. These limitations are the same as recited in independent claim 18. As such independent claim 31 is patentable over Berkey in view of Siegmund for at least the same reasons as mentioned above with respect to independent claim 18.

Still further, claims 32-34 are dependent upon independent claim 31 and are patentable over the combination of Berkey in view of Siegmund for at least the same reasons that claim 31 is patentable over the combination of Berkey in view of Siegmund within the meaning of 35 U.S.C. § 103(a).

In light of the above, claims 18-34 are patentable over the prior art of record, an indication of which is respectfully solicited.

VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A do include the amendments filed by Applicant on August 9, 2006.

Dated:

Respectfully submitted.

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APPENDIX A

Claims Involved in the Appeal of Application Serial No. 10/829,614

18. A method for making a holey fiber, said method comprising:
- stacking a plurality of structures comprising a first structure of a first material having a first softening point and a second structure of a second material having a hollow central portion and a second softening point that is higher than the first softening point, said stacking comprises arranging the plurality of structures to form a bundle containing interstices between the structures;
 - creating a fused element by heating the bundle to a fusion temperature to soften the first structure such that the first structure flows around a portion of the second structure and closes a portion of the interstices, and such that the second structure retains shape;
 - creating a preform having channels therein, by removing the second structure from the fused element;
 - drawing the preform at a draw temperature which is below the softening point of the first structure.
19. The method of claim 18, wherein said creating the fused element comprises heating the bundle to the fusion temperature of 50°C to 200°C below the second softening point, and wherein said drawing comprises drawing at a temperature that is within 70°C below the first softening point.
20. The method of claim 18, further comprising applying a partial vacuum to the bundle to remove air therefrom.

21. The method of claim 18, wherein said stacking includes stacking the plurality of structures of the first material including glass rods or tubes and the structures of the second material including glass tubes.
22. The method of claim 21, wherein said stacking the plurality of structures includes the first structures which are 0.5 mm to 5 mm in outside diameter, and the second structures which are 0.5 mm to 5 mm in outside diameter with inside diameter of 0.4 mm to 4.8 mm.
23. The method of claim 18, wherein said stacking the plurality of structures includes stacking the first and second structures, said structures comprise a silicate glass, a silica glass, a fluoride glass, a chalcogenide glass and mixtures thereof.
24. The method of claim 18, wherein said stacking a plurality of structures includes stacking the first structure comprising rods or tubes and the second structure comprising tubes.
25. The method of claim 18, wherein said creating a perform by removing the second structure comprises etching the second structure with an aqueous acidic solution.
26. The method of claim 18, wherein said creating a perform by removing the second structure comprises heating the fused element in an oxidizing environment.
27. The method of claim 18, wherein said stacking a plurality of structures further comprises stacking the second material in a central region of the bundle to form the holey fiber with a hollow core.
28. The method of claim 18, further comprises applying a partial vacuum to the bundle to remove air therefrom, and inserting the holey fiber into a clad tube made of the same lower softening point glass to form a complex structure and drawing the complex structure to form a second holey fiber of reduced cross-section.

29. The method of claim 18, further comprises providing a clad tube around the plurality of structures in a formation of a bundle, the clad tube is of the first softening point and spaces between the clad tube and the structures are filled during said creating of the fused element.
30. The method of claim 18, wherein said heating the first and second materials to a fusion temperature, wherein the fusion temperature is within 50°C below the softening point of the lower softening point material and the draw temperature is within 30°C below the softening point of the lower softening point material.
31. A method for making a holey fiber comprising:
- stacking a plurality of structures comprising a first structure of a first material having a first softening point and a second structure of a second material having a hollow central portion and a second softening point that is higher than the first softening point, the first structures being glass rods or tubes and the second structure being non-glass tubes that are rigid at the first softening point to form a bundle containing interstices between the structure;
 - forming a fused element by heating the bundle to a fusion temperature which is near the first softening point of the glass rods or tubes whereby the glass softens and flows around the non-glass tubes and closes the interstices;
 - creating a preform by removing the non-glass tubes from the fused element thus forming channels in the fused element; and
 - drawing the preform at a draw temperature which is near the softening point of the glass rod or tubes to form the holey fiber.

32. The method of claim 31, wherein said stacking the plurality of structures including the first structures being silica glass rods 1 mm to 1.5 mm in outside diameter and the second structures being graphite tubes 1 mm to 1.5 mm in outside diameter and 0.8 mm to 1.4 mm in inside diameter.
33. The method of claim 31, wherein fusion temperature is 10°C to 100°C below the softening point of the glass and the draw temperature is 10°C to 50°C below the softening point of the glass.
34. The method of claim 31, wherein said removing the non-glass tubes includes removing via etching.

APPENDIX B

Evidence entered by the Examiner and relied upon by appellant in appeal:

United States Patent Application No. 2004/0050110 A1 was entered into the record by the Examiner on page 4 of the Office Action dated June 15, 2006. United States Patent No. 3,275,428 to Siegmund was entered into the record by the Examiner on page 3 of the Office Action dated October 19, 2006.

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APPENDIX C

Related Proceedings- None.